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Prioritizing HAZOP analysis using analytic hierarchy process (AHP)

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Abstract Hazard and operability (HAZOP) analysis is one of the most widely used methods for process hazard analysis. However, the outcome of HAZOP analysis could result in identifying large number of hazards, thus posing a challenge for assessors to take actions in dealing with all the hazards. The common practice in prioritizing the critical hazards is based on assessors' experience through deductive judgment using rating scale, taking into consideration safety and the associated costs. Although being simple and straightforward, HAZOP has the disadvantage of lacking systematic approach to elucidate different conclusions into an integrated outcome, thus susceptible to inaccurate and unjustified decisions. In this paper, we present a structured methodology for incorporating prioritization in HAZOP analysis using analytic hierarchy process. Through this approach, the hazards of a process identified using HAZOP will be quantitatively weighted and ranked based on their priority along with the appropriate counter measures to be taken. The proposed methodology is a thorough decision-making tool as it does not only prioritize the hazards identified from the HAZOP assessment, but also provides medium for the assessors to quantitatively analyze the hazards. To show its efficacy, the approach will be applied to a simple reactor unit and a more complex system of dividing wall column pilot plant as case studies. The result shows that the proposed methodology is capable of identifying and ranking the most significant hazards in a process following HAZOP analysis. This is particularly useful, especially to process designers/engineers in prioritizing their efforts and resources on more significant hazards, hence aiding toward achieving an inherently safer chemical process.

Keywords HAZOP · Analytic hierarchy process (AHP) · Decision making · Dividing wall column · Fatty acid fractionation

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